

Declining Birth rates in the US: An Analysis of Potential Factors*

Reproduction of ‘The Puzzle of Falling US Birth Rates since the Great Recession’
(Kearney, Levine & Pardue, 2022)

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Abstract

Over the past 10 years, US birth rates have been dropping steadily to an all time low of 55.8 per 1,000 women in 2020. Kearney, Levine and Pardue (2022) analyzed this phenomenon by exploring demographic, economic, social and policy factors to little avail in enlightenment. However, they did discover a correlation between the decline and the birth cohorts of mothers, and offer the conjecture of shifting priorities as the reasoning. We replicate the results of this study with respect to the demographic and cohort effects, and discuss alternative interpretations of the data considering the impact of the feminist movement and the evolution of technology and media. The results were consistent with the initial study.

1 Introduction

Birth rate is the number of live births per thousand in the population by year (Google dictionary). It is closely related to total fertility rate, which is the number of children that a hypothetical female would have over the course of her reproductive life Statistics Canada. Birth rate is important since it is an indicator of population growth and determines the age structure of populations, which has various implications for the economy and society (Cleland 2008). When the birth rate is too high or low, it affects all subgroups of the population in different ways, for example, a large number of new births will be a burden on the adult population to support them, and when this group ages to be elderly they will be a burden on governments to support them (Cleland 2008).

There are many possible factors that can affect birth rate. Recessions have been proposed to result in a drop in birth rates, specifically the Great Recession of 2007 (Livingston and Cohn 2010; Percheski and Kimbro 2014; Sobotka and Philipov 2011). Becker (1960) proposes an economic framework for fertility, where the “demand for children” is driven by the satisfaction that children brings to people weighted against factors such as preferences (e.g. religion, race, age), income, time, expenditure and means to support each child and other considerations (e.g. contraception, marriage). Kearney, Levine, and Pardue (2022) base their analysis of the declining US birth rates on these factors.

These analyses however, did not provide sufficient evidence to explain the decline in birth rates, with the authors stating “For any factor to have explained much of that decline, it would have had to change dramatically around the same time.” (Kearney, Levine, and Pardue 2022). Kearney, Levine, and Pardue (2022) then went on to find a correlation between the recent birth cohorts of mothers and the substantial decline. In our reproduction of their paper, we build on their ‘shifting priorities’ explanation of the cohort effects by

*Code and data are available at: <https://github.com/KCtt457/us-birth-rates-decline>. A replication of various aspects in this paper are available at: <https://www.socialsciencereproduction.org/reproductions/a5fd3a5f-e295-4061-a7ba-60e52338d110/index>

considering the other notable events that potentially may have influenced the nature of parenting of these cohorts, namely the Third wave of Feminism and the second half of the Digital Revolution.

We replicate the paper by Kearney, Levine, and Pardue (2022) with a focus on the following research questions:

- What is the trend in US birth rates over the period 1980-2020?
- How does the trend in birth rates vary with demographic factors such as age, race, education and marital status?
- How do the birth rates vary for different cohorts of mothers by their birth year?

While the original paper used Stata (StataCorp 2021) for data processing and analysis, we use R (R Core Team 2020) for all data wrangling and analysis.

2 Data

2.1 Data Source and Methodology

The data on birth rates per 1,000 women ages 15-44 across all races and demographic population subgroups are obtained from the National Vital Statistics Reports for the years 2015, 2019 and 2020 (Martin and Mathews 2017; Martin and Driscoll 2021; Hamilton and Osterman 2021), which they collected from birth certificates registered in all US states and the District of Colombia. Aggregated data on the number of births for 6 different 5-year cohorts of mothers by their age and birth year is provided by Kearney, Levine, and Pardue (2022), calculated using public birth microdata across the period 1980-1989 from the NBER Natality Database and NCHS microdata from the period 1990-2019 (CDC NCHS 2020, NBER 2021b). The cohorts span the years 1968-1997.

Single-age population counts, among all races from 1969-2019 and by race and Hispanic origin from 1990-2019, is obtained from the CDC SEER database (CDC NCI 2021).

2.2 Attributes

The birth data consists of variables for the year, and birth rates for each population subgroup. For example, for race there are 3 variables: birth rate for whites, birth rate for blacks and birth rate for hispanics. There is birth rate data for 4 population subgroups - age (5-year groupings), race and ethnicity, marital status and mother's level of education. We show a glimpse of the data with variables for race and marital status in table 1.

For the aggregated cohort birth data, the variables are mother's age, birth cohort, number of births and cumulative births. The population data provided by Kearney, Levine, and Pardue (2022) gives the population count for women by age, year and state. We group the population count by cohort and mother's age and join this to the cohort birth data, with the first 10 rows of this data shown in table 2.

3 Results

3.1 Overall Trend in US Birth Rates

Figure 1 is a replication of Figure 1 in the original paper. Between 1980 and 2007, the birth rates generally remained between 65-70 births per 1,000 women ages 15-44, with a minimum rate of 63.6 in 1997 and a maximum rate of 70.9 in 1990. The grey dashed lines mark the years of past recessions (add citation), where we generally see a pattern of decline followed by an uptick in birth rates. After the Great Recession of 2007

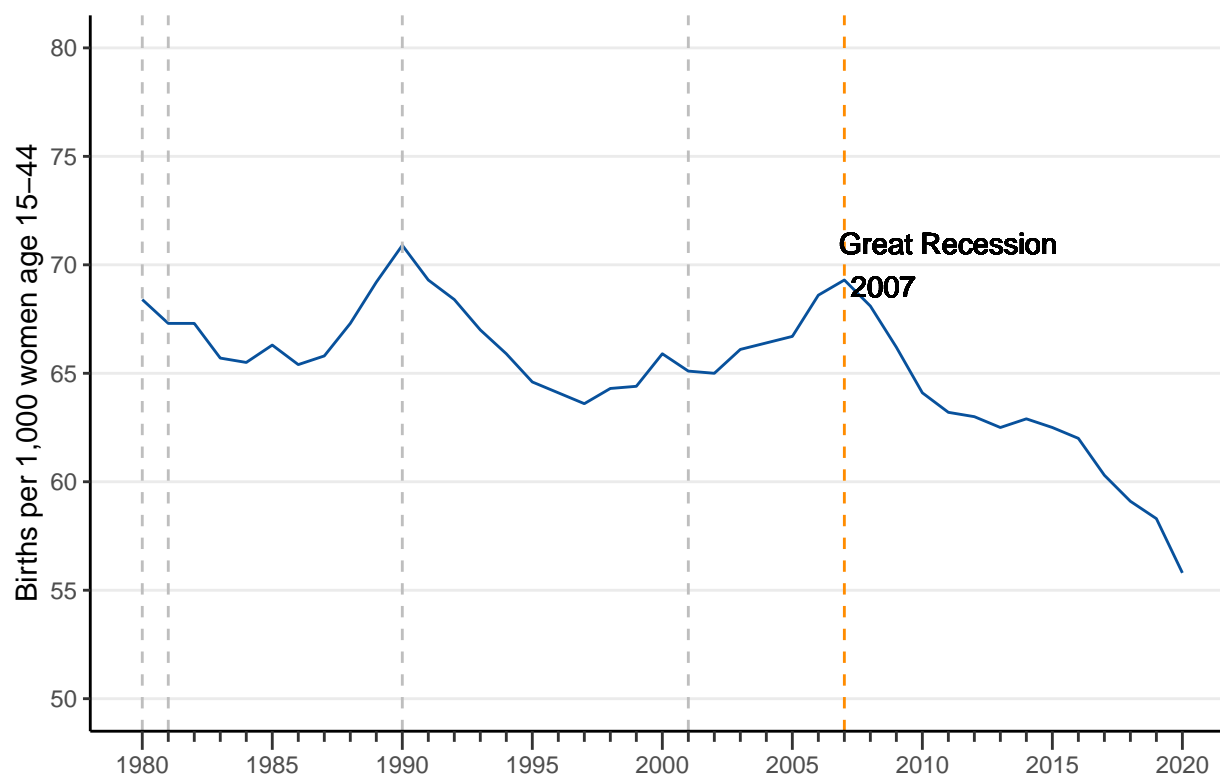
Table 1: Ten rows of the birth rate data for years 1980-2020

Year	All races	White, non-Hispanic	Black, non-Hispanic	Hispanic	Unmarried	Married
1990	70.9	62.8	89.0	107.7	43.8	93.2
1991	69.3	60.9	87.0	106.9	45.2	89.9
1992	68.4	60.0	84.5	106.1	45.2	89.0
1993	67.0	58.9	81.5	103.3	45.3	86.8
1994	65.9	58.2	77.5	100.7	46.9	83.8
1995	64.6	57.5	72.8	98.8	45.1	83.7
1996	64.1	57.1	70.7	97.5	44.8	83.7
1997	63.6	56.8	70.3	94.2	44.0	84.3
1998	64.3	57.6	70.9	93.2	44.3	85.7
1999	64.4	57.7	69.9	93.0	44.4	86.5

Table 2: First ten rows of the birth cohort data for 6 birth cohorts

Cohort #	Birth Years	Mother's age	Number of births	Cumulative births	Population Count
1	1968-1972	15	121158	121158	8978763
1	1968-1972	16	268005	389163	8987457
1	1968-1972	17	461462	850625	9102192
1	1968-1972	18	677810	1528435	9092741
1	1968-1972	19	892714	2421149	9655879
1	1968-1972	20	1004168	3425317	9625147
1	1968-1972	21	1060746	4486063	9454383
1	1968-1972	22	1074214	5560277	9273533
1	1968-1972	23	1054644	6614921	9295797
1	1968-1972	24	1049909	7664830	9542999

however, there was a steady decline, diving below its past minimum rate from 1997 with a birth rate of 63.2 in 2011, and no resurgence so far. The lowest birth rate on the graph occurs in 2020 with 55.8 births per 1,000 women, which is a steep drop of 2.5 from the previous year.



Source: Birth Rates collected from CDC Vital Statistics Births Reports for 2015, 2019 and 2020.

Figure 1: Trend in US Birth Rates

3.2 Demographic Factors

Figure 2 is a replication of plots A, B, D and E of Figure 2 in the original paper.

Plot A shows the trend in birth rates over the period 1980-2020 by five-year age groups. As one would expect, the oldest age group 40-44 has the lowest birth rate. Of note is that the birth rates for older age groups 30-34, 35-39 and 40-44 have been increasing over the period, whereas the younger age groups 15-19, 20-24, 25-29 have been decreasing. The inflection point of increase/decrease is especially noticeable at the year 2007.

Plot B shows the trend in birth rates over the period 1980-2020 for different races and ethnicities. Non-Hispanic black and white groups show a fairly constant trend in birth rates over the period, whereas the Hispanic group shows a significant drop after the Great Recession.

Plot C shows the trend in birth rates over the period 1980-2020 for married vs unmarried mothers. Besides the small increase for unmarried women between 1980 and 1990, the trends do not demonstrate significant fluctuations in birth rates. The birth rate is higher for married mothers than unmarried mothers.

Plot D shows the trend in birth rates over the period 1980-2020 for different levels of the mothers' education. The birth rates for highschool graduates, college graduates and mothers with some college education remains

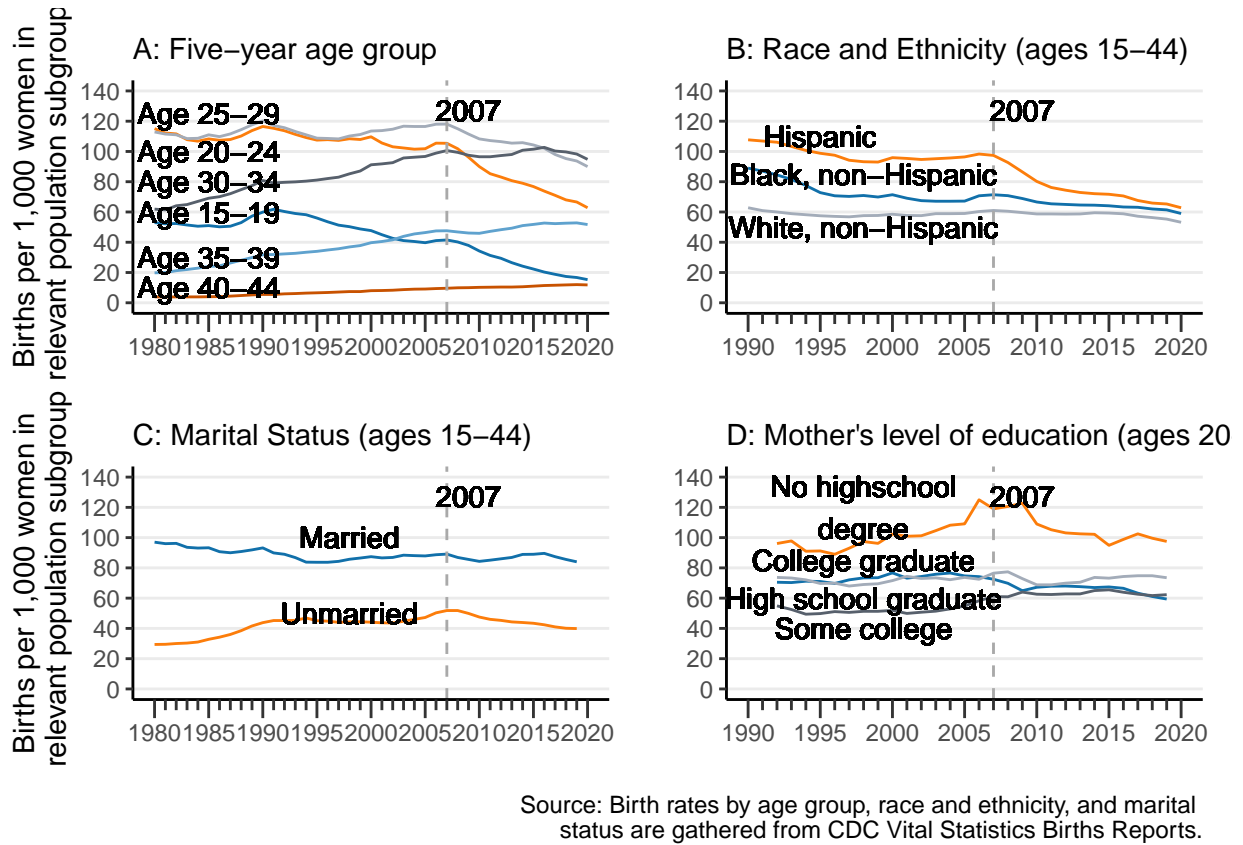


Figure 2: Trends in Birth Rates by Population Subgroup

in about the same range after 2007. Mothers with no highschool degree have the highest birth rate of the 4 education groups, and the birth rate rises and falls around 2007 before stabilizing to pre-recession levels.

3.3 Cohort effects

Figure 3 is a replication of Figure 5 of the original paper. The cumulative birth rates for the 3 earlier cohorts are more similar to each other than the 3 later cohorts, with the latest cohort showing the lowest number of children ever born.

4 Discussion

In Figure 1, we saw that the birth rate enters a persistent decline after the Great Recession in 2007. However, one is left to wonder if this recession is really the event to demarcate this trend in birth rates, since it does not mirror the pattern of recessions prior.

4.1 Why is the birth rate declining? - Demographic insights

To investigate this idea more, we first turn to the trends among the various demographic subgroups. For the different age groups, the decreasing trend among younger age groups and increasing trend among older

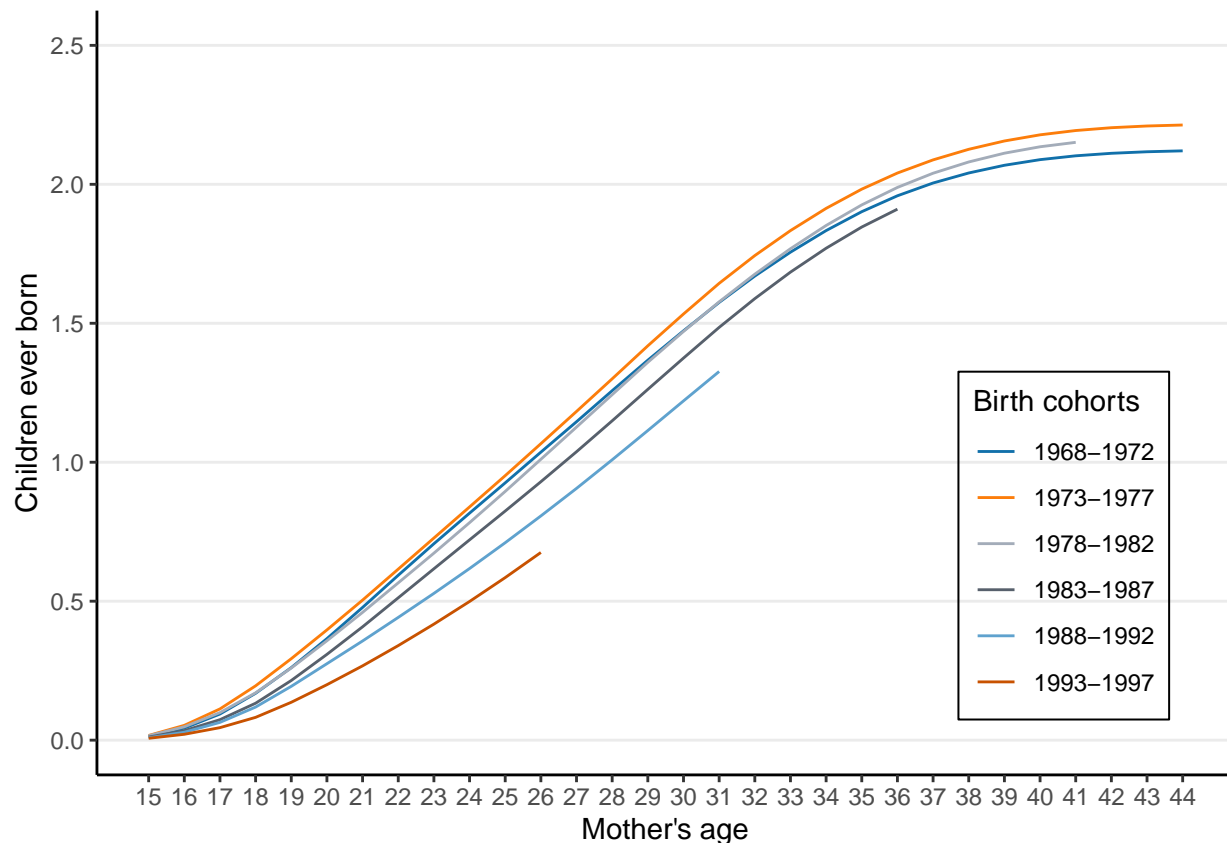


Figure 3: Children Ever Born by Mother's Age and Birth Cohort

age groups points to the idea that women are choosing to have children later in life, an attitudinal change. Only the age 20-24 group seems to show a decrease at the 2007 mark that differs significantly from the years prior. One explanation is that it is the age when most people attend university, and more women are applying for tertiary education and pursuing education before having children. In fact, the National Center for Education Statistics (NCES) data shows a 17.6% increase in undergraduate enrollment among females from 2007 to 2011 (NCES, 2020), which coincides perfectly with the 19.1% decrease in birth rates in the 4 years after the Great Recession began in 2007.

For race and ethnicity, the birth rates for Black and White women remains fairly constant and only the Hispanic women show a significant decline in the years 2007-2011 before it plateaus to follow a similar trend to the other two races. Kearney, Levine, and Pardue (2022) offer assimilation as a possible explanation with evidence from Tavernise 2019, Parrado and Morgan (2008).

For marital status, married and unmarried women have fairly unchanged birth rates around 2007, so it does not appear to be affected too much by the recession or other events around this time. The small decrease in birth rates for unmarried women is possibly to the decline in teenage births (ages 15-19) that we saw in Figure 2 plot A, since women are marrying later and therefore teenage women make up a larger proportion of the unmarried women population in their childbearing years (US Census Bureau).

For education level, the groups do not appear to demonstrate any change in birth rates with the presence of the Great Recession, except for the no highschool degree group. Its rise and fall in birth rates may be related to the boom in the residential housing market leading up to the recession, where many subprime mortgages were given out, that is, loans to persons with low credit ratings, of which women with a lack of education i.e. no highschool degree would fall under (Insider, 2021). Thus, more women in this group may

have chosen to buy homes and start families, and then the recession hit and reversed this effect.

Thus across these demographic groups that we have examined, we note two things: 1) the declining trend in the total female population of childbearing age is not paralleled equally across its subgroups of age, race and ethnicity, marital status and education level, but 2) specifically we note that younger age groups, Hispanic women and women with no highschool degree showed a significant decrease in birth rates of which only the no highschool degree mamas seem to be related to the Great Recession. We did mention earlier however, that there seems to be an attitudinal change among the women close the recession - women having children later in life, getting married later, and more women attending colleges and universities - which leads into our discussion of cohort effects.

4.2 Cohort effects - attitudes of a new generation

From Figure 3, it was shown that the birth cohorts in years 1968-1982 are quite similar to each other whereas the cohorts born in years 1983-1997 seemed to pull more away with lower birth rates compared to the predecessors. In fact, these two groupings of years define two distinct generations respectively: Generation X and Generation Y, or the “Millennials” (Pew Research Center, 2019). Pew Research Center (2019) conducted a study comparing various lifestyle factors such as education, income, family and housing of Millennials to its prior generations and there are some stark differences.

Notably, women are delaying motherhood as according to the Pew Research Center analysis of the Census Bureau’s Current Population Survey data, 2016 saw 48% of Millennial women (ages 20 to 35 at the time) having given birth to at least one child compared to the previous generation where 57% of women were already moms in 2000 for the same age range (Citation). The marriage status for millennials also shows similar figures with 46% of Millennial women ages 25 to 37 being married compared to 57% of Generation X-ers for the same age range (Pew Research Center), and less millennial women are married for lower levels of education. Additionally, the generations are becoming more racially and ethnically diverse (Pew Research Center) with the population of Hispanics less likely to be foreign-born (Kearney, Levine, and Pardue 2022). These support our arguments for the change in birth rate trends for women of the different age groups, marital status and race and ethnicity that was discussed in the previous section.

So it now begs the question, why are the attitudes between these two generations so different? We briefly touch on some historical events that surely would have influenced change in Generation Y.

4.3 The Digital Revolution and Third Wave Feminism

The birth years of the millennial generation were characterized by several milestones in the Digital Revolution: the first mobile phone (1984), digital camera (1988) and the world wide web (1989) (Science & Technology Facilities Council). When the first set of millennials would turn about 10 years old, CERN’s web browser software was released for public use (1991) and commercial dial up internet became available (1992). In their teenage years to follow, smartphones, social media and high speed internet would be developed creating a tech-savvy generation like never before.

It also happens that Generation X coincides with the years of the second wave of feminism (1963 - 1980s) whereas the formative years of millennials coincide the years of the third wave of feminism (Vox). The third wave of the feminist movement began with the Anita Hill sexual harassment case in 1991, followed by the “Year of the Woman” in 1992 where a record-breaking number of women candidates were elected to the House of Representatives and Senate (American Women and Politics (1993), as cited in Dolan (1998), p. 272). The third wave of feminism attempts to be distinctive from its predecessor, with some claims in popular literature of it to have a culture of ‘girl power,’ be more open-minded, more racially diverse and inclusive than the second wave, although it is disputed whether some of these claims are exaggerated (Snyder 2008).

Therefore, the influence of technology and mass media that comes with it as well as the different ideologies behind feminism and women empowerment may have shaped the different attitudes we see between the more recent birth cohorts and older cohorts, and hence the decline in birth rates.

4.4 The decline not an effect of the Great Recession?

Back to Figure 1, we noted that the first time the birth rate dipped below minimum from previous years was in 2011, which, upon reflection after our discussion, is almost exactly 20 years after the commercial dial up internet became available and the third wave feminist movement began. 2012 is the year when the birth cohort 1988-1992 was ages 20-24, which is the first cohort to pull away significantly in birth rates to the previous ones. So are these other historical events indirectly responsible for the decline in birth rates by influencing women's attitudes, and not the Great Recession? This is left as food for thought for now, more research would be needed to investigate this question.

5 Conclusion

We explored the trend in birth rates in the US for the period 1980-2020 among the total child-bearing population, and demographic subgroups by age, race and ethnicity, marital status and level of education. Overall there is a decline, but the trend oftentimes remains constant for different subgroups and only declines significantly for specific groups such as younger age groups, Hispanic women and women with no highschool degree after 2007. The original paper by Kearney, Levine, and Pardue (2022) uses the Great Recession as the event to mark the beginning of the birth rate decline, but although we acknowledge some effect of the recession on decreasing birth rates, we conjecture that the lasting and continuous decline is greater explained by the shifting attitudes towards when and if to have children in the new generation, and that the decline would have been evident even if the recession had not occurred.

However, if women are simply choosing to have children later and not to not have children at all, we should expect a pick back up in the birth rates in the coming decade.

5.1 Weaknesses and next steps

A weakness is that we only described a subset of the demographic variables that were presented in Kearney, Levine, and Pardue (2022)'s paper and so the analysis could have been more complete. I do not claim to be an expert on the technological revolution or feminism, and we only provided these themes as potential explanatory factors for the change in attitude that is causing the decline in birth rates. More research into how these variables correlate with the different generational groups or birth cohorts is needed to make stronger statistical claims, such as by collecting data on women's beliefs.

Appendix

A Additional details

References

- American Women, Center for the, and Politics. 1993. “Fact Sheet.”
- Becker, Gary. 1960. “An Economic Analysis of Fertility.” In *Demographic and Economic Change in Developed Countries*, 209–40. National Bureau of Economic Research, Inc. <https://EconPapers.repec.org/RePEc:nbr:nberch:2387>.
- Cleland, J. G. 2008. “Trends in Human Fertility.” In *International Encyclopedia of Public Health*, edited by Harald Kristian (Kris) Heggenhougen, 364–71. Oxford: Academic Press. <https://doi.org/https://doi.org/10.1016/B978-012373960-5.00473-1>.
- Dolan, Kathleen. 1998. “Voting for Women in the “Year of the Woman.”” *American Journal of Political Science* 42 (1): 272. <https://doi.org/10.2307/2991756>.
- Hamilton, Martin, Brady E., and Michelle J. K. Osterman. 2021. “Births: Provisional Data for 2020.” *Vital Statistics Rapid Release*, no. 12: 6. <https://doi.org/https://doi.org/10.15620/cdc:104993>.
- Kearney, Melissa S., Phillip B. Levine, and Luke Pardue. 2022. “The Puzzle of Falling US Birth Rates Since the Great Recession.” *Journal of Economic Perspectives* 36 (1): 151–76. <https://doi.org/10.1257/jep.36.1.151>.
- Livingston, Gretchen, and D’Vera Cohn. 2010. “U.s. Birth Rate Decline Linked to Recession,” 1–13. <https://www.pewresearch.org/wp-content/uploads/sites/3/2010/10/753-birth-rates-recession.pdf>.
- Martin, Hamilton, Joyce A., and Anne K. Driscoll. 2021. “Births: Final Data for 2019.” *National Vital Statistics Report* 70 (2): 13. <https://doi.org/https://dx.doi.org/10.15620/cdc:100472>.
- Martin, Hamilton, Joyce A., and T. J. Mathews. 2017. “Births: Final Data for 2015.” *National Vital Statistics Report* 66 (1): 35. https://www.cdc.gov/nchs/data/nvsr/nvsr66/nvsr66_01.pdf.
- Percheski, Christine, and Rachel Kimbro. 2014. “How Did the Great Recession Affect Fertility?” *Focus* 30 (2): 26–30. <https://www.irp.wisc.edu/publications/focus/pdfs/foc302g.pdf>.
- R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Snyder, R. Claire. 2008. “What Is Third-Wave Feminism? A New Directions Essay.” *Signs: Journal of Women in Culture and Society* 34 (1): 175–96. <https://doi.org/10.1086/588436>.
- Sobotka, Vegard Skirbekk, Tomáš, and Dimitar Philipov. 2011. “Economic Recession and Fertility in the Developed World.” *Population and Development Review* 37 (2): 267–306. <https://doi.org/https://doi.org/10.1111/j.1728-4457.2011.00411.x>.
- StataCorp. 2021. *Stata Statistical Software: Release 17*. College Station, TX: StataCorp LLC. <https://www.stata.com>.